

## Annual Business

WITH this issue we begin the AIAA 2003 *Evolution of Flight* celebration. We plan to publish a series of special *History of Key Technologies* papers throughout the year. Historical papers will address technologies within the scope of the *JGCD*. Several authors are in the process of preparing contributions. Ray Prouty's and "Pat" Curtiss' "Helicopter Control Systems" paper in this issue is an outstanding start to the series. Thank you, Ray and Pat.

Overall, this past year was an excellent one for the *JGCD*, and some highlights follow:

1) Use of the online *JGCD* version has increased with worldwide researchers now using the reference link option and also the "search" feature to find references to past work. For example, a search using the keyword "inertial" showed 24 articles in the *JGCD* since 1997 and 696 articles in the entire CatchWord database. Many of these references have a direct link to them for easy retrieval.

2) Our Associate Editors continued to do a great job in getting reviews back to authors in a timely fashion. In fact, in July, August, and September there were only about six papers submitted in the previous six months that had not been returned to the authors. This is truly a dedicated effort by our Associate Editors and I want to thank them.

3) During the year, the Editors-in-Chief and the AIAA staff began the development of a Web-based manuscript submission and management system for all six journals. Initial implementation and testing is underway and I look forward to completion of this important effort in 2003.

In past editorials I have written about the progress made during the year towards meeting the goals that I have as Editor-in-Chief. The goals are 1) to maintain the quality of the *JGCD*, 2) to increase the number of engineering applications-oriented papers, 3) to minimize the time from submission to publication, 4) to increase the international involvement in the *JGCD*, and 5) to listen to and respond to everyone's concerns. Let me briefly discuss each item.

In terms of quality, the *JGCD* was reviewed by an independent committee commissioned by the AIAA Publications Committee, and it was chaired by Professor Arthur Bryson. The overall finding was that the "*JGCD* is well-managed and is the leading journal in its field" (see Vol. 25, No. 3, pp. 417–418). We continue to attract high-quality papers submitted on a worldwide basis. However, the number of applications-oriented papers submitted needs to be increased, and I repeat the call to the community to respond with more relevant papers that can help engineers practice their profession. I hope the appointment of three new Associate Editors (see below) helps to stimulate applications-oriented papers.

The Associate Editors have worked hard to try to shorten the time from submission of a paper to when review comments are returned to authors. I am pleased that their efforts have substantially decreased the review time. Our goal is to return every paper within three months of receipt, with an upper limit of six months. Then it will be up to authors to make revisions as quickly as possible to speed their papers towards publication.

International participation in the *JGCD* has continued at previous levels. Approximately 45% of new paper submissions are from outside the United States, and the acceptance rate for these papers is about the same as for U.S. papers. Publication tends to be a bit slower, however, as more of these papers need extensive editorial work and revisions of figures. Our International Advisors have been very helpful in soliciting papers. The fact that the *JGCD* is online should aid our international authors and increase our subscription base.

Also with this issue, I am announcing the following changes to our editorial staff:

Renewed for a second three-year term is Associate Editor Dr. Peiman Maghami, NASA Langley Research Center.

I want to welcome the following new Associate Editors who will start three-year terms:

- Dr. David Doman, Air Force Research Laboratory, Wright–Patterson Air Force Base
- Dr. Wodek Gawronski, Jet Propulsion Laboratory, California Institute of Technology
- Mr. David Vallado, Raytheon Command, Control, Communications, and Information Systems

I want to express my thanks to our retiring Associate Editors for their service:

- Professor Andrew Kurdila, University of Florida
- Professor Arun Misra, McGill University
- Professor Minh Phan, Dartmouth College

The complete list of current Associate Editors is presented in the following pages.

I must also express my gratitude to all our anonymous reviewers who perform peer reviews that are necessary to maintain the quality of the *JGCD*. The list of reviewers contributing between 1 October 2001 and 30 September 2002 follows the list of Associate Editors. I apologize to any reviewers whose names have been inadvertently omitted from the list.

I would like to acknowledge our International Advisors, who help us in soliciting high-quality papers that represent technical efforts in their countries. They also assist authors who may have questions about the review process. I would like to thank our retired International Advisors: Professor Itzhack Bar-Itzhack, Technion—Israel Institute of Technology, Israel; and Dr. David Salmond, Defence Evaluation and Research Agency, UK. I welcome new International Advisors: Dr. Kelvin Halsey, QinetiQ, UK; and Dr. Yaakov Osham, Technion—Israel Institute of Technology, Israel.

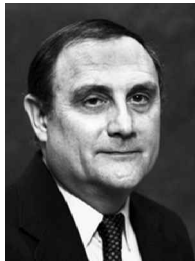
I also wish to acknowledge individuals serving as liaisons between the *JGCD* and AIAA Technical Committees (TCs): Professor Mark Balas, University of Colorado, with the Guidance, Navigation, and Control TC; Lester Sackett, Draper Laboratory, with the Astrodynamics TC; and Professor John Valasek, with the Atmospheric Flight Mechanics TC.

Thanks to all the editorial staff at AIAA Headquarters and to the production staff at TechBooks. These dedicated individuals work at the highest standards in producing the *JGCD*. Thanks also to Ms. Lisa Gorman and Ms. Loretta Mitrano, Draper Laboratory, for making the Editor-in-Chief's office operate smoothly and efficiently all year long, and to Draper Laboratory for its support of the *JGCD*.

Finally, I continue to encourage communications between our readers and any member of the editorial staff. I also believe we did a good job last year in covering the span of interests of our readers and in responding quickly to communications. We can do better and we are willing to listen, please contact me directly. My contact information is:

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## Editor-in-Chief



**GEORGE T. SCHMIDT** received his S.B. and S.M. in aeronautics and astronautics from the Massachusetts Institute of Technology (MIT) in 1965 and his Sc.D. in instrumentation from MIT in 1971. Since 1965 he has worked at the Charles Stark Draper Laboratory, Cambridge, Massachusetts, where he is currently Director, Education. Prior to that he was the Leader of the Guidance and Navigation Division and Director of the Guidance Technology Center. His major technical activities have been in GN&C system design for missiles, aircraft, and manned spacecraft; Kalman filtering application; and integration techniques for high-resolution synthetic aperture radars, global positioning systems (GPS), and inertial sensors. Starting in 1968 he has served the NATO Research and Technology Organization (formerly AGARD) in many positions, including as a U.S. member of the Guidance and Control Panel. He is a Lecturer in Aeronautics and Astronautics at MIT. He is an Associate Fellow of the AIAA, a Senior Member of the Institute of Electrical and Electronics Engineers, a member of the Institute of Navigation, and he is an elected member of the Russian Federation, Academy of Navigation and Motion Control. He received several awards including the AIAA International Cooperation Award in 2001. He is on the Editorial Board of the Draper Technology Digest. He is author or contributing author of more than 60 technical papers and reports, encyclopedia articles, and textbooks. He has been Editor-in-Chief of the AIAA *Journal of Guidance, Control, and Dynamics* since 1996.

## Associate Editors



**KURT S. ANDERSON**, Associate Professor of the Department of Mechanical, Aerospace, and Nuclear Engineering at Rensselaer Polytechnic Institute, received his Ph.D. in applied and computational mechanics from Stanford University in 1990. After that time he worked in the areas of dynamics, structural dynamics, and controls for TRW Space and Technology in Redondo Beach, California. Dr. Anderson subsequently accepted a two-year appointment as a visiting scholar, lecturer, and research fellow at the Darmstadt Technical University of Darmstadt in Germany. He then spent a short period in the Department of Aeronautical Engineering, Applied Mechanics, and Aviation at the Ohio State University in Columbus. Since earning his Ph.D., Dr. Anderson has continued to work in the areas of computational multibody dynamics. His focus is on the development of advanced algorithms including, but not limited to, low computational order algorithms for dynamic systems simulation and control, design sensitivity analysis of dynamic systems, parallel computing applications, characterization of translating dynamic media, and numerical integration schemes. Dr. Anderson enjoys woodcarving, gourmet cooking, bike riding, hiking, horseback riding, and flyfishing.



**S. N. BALAKRISHNAN** is currently a Professor of Aerospace Engineering in the Department of Mechanical and Aerospace Engineering and Engineering Mechanics at the University of Missouri—Rolla (UMR). He received his Ph.D. in aerospace engineering at the University of Texas at Austin. Dr. Balakrishnan's professional roles include Lead Engineer, Lockheed Electronics Company, Houston, Texas, where he worked in the space shuttle program; Scientist and Fellow, Center for Space Research, University of Texas at Austin; and Faculty Research Fellow, Wright Laboratory (Eglin Air Force Base, Florida). He teaches stability and control and advanced control courses at UMR. His research activities focus on neural networks in trajectory optimization, and control, missile guidance, and multiple target-multiple sensor problems and estimation. He has authored/coauthored about 55 journal articles and refereed conference papers in these areas. Dr. Balakrishnan is a Member of the AIAA Guidance, Navigation, and Control Technical Committee, an Associate Fellow of AIAA, and Director, American Automatic Control Council.



**KARL D. BILIMORIA** is an Aerospace Engineer at the NASA Ames Research Center, where he leads a research group on future air traffic control concepts for NASA's Airspace Systems program. Previously, he worked on advanced guidance and control concepts for supersonic civil transport aircraft under NASA's High Speed Research (HSR) program. He received his B.Tech. from the Indian Institute of Technology, Kanpur, graduating at the top of the aeronautical engineering class in 1982; he also received his M.S. and Ph.D. in aerospace engineering from Virginia Polytechnic Institute and State University in 1984 and 1986 respectively. From 1987 to 1994, Dr. Bilimoria was on the aerospace engineering faculty at Arizona State University (ASU), where he held the positions of Assistant Professor and Research Scientist. At ASU, he taught courses on optimal control, flight dynamics/control, aircraft performance, and aircraft conceptual design; he also conducted research on aircraft trajectory optimization, optimal control of spacecraft, and flight dynamics of elastic hypersonic vehicles. He is an Associate Fellow of AIAA; a Member of the AIAA Guidance, Navigation, and Control Technical Committee (TC); a past Member of the AIAA Atmospheric Flight Mechanics TC; a past Member of the IFAC TC on Air Traffic Control Automation; and a Member of Sigma Gamma Tau (national aerospace honor society). Dr. Bilimoria was a finalist in the 1996 NASA Astronaut selection.



**ALAIN CARRIER** received his Ph.D. in aeronautics and astronautics from Stanford University in 1990. Since then he has been working for the Lockheed Martin Advanced Technology Center, leading applied research and optical-precision instrumentation design, modeling, and control. He led the development of several actively controlled electromechanical systems from concept to hardware demonstration, including actively controlled segmented optics, secondary and fast steering mirrors for astronomical telescopes, zero-G slew suspensions for space structures, active and passive vibration isolators, smart actuators, and a latch mechanism actuated by Shape Memory Alloy springs for which he owns a patent. He is the author of *Principal Gain Tracking*, a novel testing and system identification technique for high-modal-density lightly-damped structures. He currently leads the development of the pointing control system for HIRDLS (an earth observing radiometer) and the development and experimental demonstration of adaptive control techniques for vibration isolation. His research interests are in isolation, control, and passive damping of broadband and periodic mechanical vibrations for optical instruments; subarcsecond optical pointing and beam control for earth observing, laser communication, and astronomical instruments; actuators and sensors for structural control; dynamics modeling of space structures and instruments; and attitude control, stationkeeping, slews, and orbital maneuvers of spacecraft and "sciencecraft."



**RICHARD COLGREN**, Senior Staff Engineer at the Lockheed Martin Aeronautics Company in Palmdale, California, is Lead Engineer for C4ISR and UAV programs for Air Vehicle Sciences and Systems. He earned his B.S. in aeronautics and astronautics at the University of Washington and his M.S. and Ph.D. in electrical engineering systems at the University of Southern California. Previously he was Flight Control Systems Lead for RECEE and Advanced Programs, and before that IPT Lead for Specialist Support on the DarkStar UAV (Tier III-). He was also IPT Lead for the Vehicle Management System on the Uninhabited Combat Air Vehicle, and was Lead Flight Controls Engineer on the U-2S and on the Air Force Multivariable Control Theory project. He has served as Project Engineer/Principal Investigator on independent research and development projects including Technologies for Reliable Autonomous Control, development of the Lockheed flight controls workstation, and the state reduction of structural dynamic models for control systems design. Previous work includes feasibility studies and preliminary/advanced design for flight control system concepts. Work on UAV projects includes Tier IIC, Tier III-, Tier III, X-33, UCAV, micro- UAVs, the Wraith Remotely Piloted Vehicle, and other projects. Dr. Colgren is a past Chair of the Integrated Controls Subcommittee of the Lockheed Corporate Task Force. Dr. Colgren is an aeronautical engineering evaluator for the Accreditation Board for Engineering and Technology, Inc./Aeronautical. He is an Associate Fellow of the AIAA, and is a Member and past Secretary for the National Technical Committee on Guidance, Navigation, and Control.



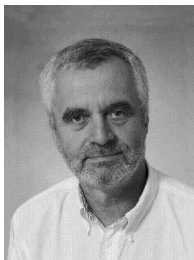
**VICTORIA L. COVERSTONE** is an Associate Professor of Aeronautical and Astronautical Engineering at the University of Illinois at Urbana-Champaign (UIUC). Previous experience includes employment at TRW as a member of the technical staff and at the NASA Jet Propulsion Laboratory as a summer faculty fellow. She earned her B.S., M.S., and Ph.D. from UIUC in 1985, 1986, and 1992. Her research interests include designing, modeling, and controlling space systems. She is a member of the Phi Kappa Phi and Tau Beta Pi Honorary Societies and the recipient of several teaching awards. She is an Associate Fellow of AIAA and has served on the AIAA Astrodynamics Technical Committee, as well as its awards subcommittee.



**DAVID DOMAN** is a Senior Aerospace Engineer with the Air Vehicles Directorate of the Air Force Research Laboratory (AFRL) at Wright-Patterson AFB in Dayton, OH. He received his B.S. in aerospace engineering (magna cum laude) from West Virginia University in 1991, his M.S. in aeronautics and astronautics from Purdue University in 1993, and his Ph.D. in aerospace engineering from Virginia Polytechnic Institute and State University in 1998. From 1993 to 1995 he worked as a Research Aerospace Engineer in the Flying Qualities group at the USAF Wright Laboratory where he focused on control theoretical modeling of human operator dynamics. He is currently the Technical Area Lead for the Space Access and Hypersonic Vehicle Guidance and Control Group in the Control Science Center of Excellence at AFRL where he is responsible for conducting and directing research in the areas of adaptive guidance and control, online trajectory retargeting algorithms, and nonlinear control allocation. He is also responsible for an integrated adaptive guidance and control flight demonstration program. Dr. Doman has published over 20 refereed conference papers, journal articles, and technical reports, and he currently holds one U.S. patent. He was the co-recipient of the 2000 Dr. Courtland D. Perkins Award for Engineering Excellence at the Air Vehicles Directorate of AFRL. He is a Senior Member of the AIAA; a Member of the Institute of Electrical and Electronics Engineers (IEEE); an Associate Editor of the IEEE Control Systems Society's Conference Editorial Board; a Member of the AIAA Technical Committee on Guidance, Navigation, and Control; and a Member of Tau Beta Pi and Sigma Gamma Tau.



**DALE F. ENNS** is a Senior Research Fellow in the Dynamics and Control Technology Section at Honeywell's Technology Center where he has worked for 21 years. He served as the Technical Lead for several research and development projects that have involved modeling, design, and analysis of guidance and control systems for a variety of aerospace applications including business and commuter fixed and rotary wing aircraft, X-38 lifting body, X-35 ASTOVL fighter, F-18 High Angle-of-Attack Research Vehicle, X-30 National Aerospace Plane, X-29 Forward Swept Wing Aircraft, F-8 Oblique Wing Research Aircraft, MD-11 Autoland, AH-64 Apache Helicopter, APM and CGSP guided artillery shells, large elastic space structures and ring laser gyro navigation, and automated highways studies. Dr. Enns is also an Associate Professor in the Aerospace Engineering and Mechanics department at the University of Minnesota where he has been teaching for 17 years. He teaches senior level required and elective courses on aircraft modeling, dynamics, control, flight mechanics, and random vibrations, as well as graduate level control courses. He also advises graduate students. He received his B.S. (1979) in aerospace engineering and mechanics from the University of Minnesota, his M.S. (1980) in aeronautics and astronautics from Stanford University, and his Ph.D. (1984) in aeronautics and astronautics from Stanford University. He is a Senior Member of the AIAA.



**WODEK GAWRONSKI** is a Principal Engineer at the Jet Propulsion Laboratory, California Institute of Technology. He received his M.S. (1968), Ph.D. (1970), and D.Sc. (1975) from the Gdansk University of Technology, Gdansk, Poland. He was a Professor at the Gdansk University of Technology (1970–1983), a Visiting Professor at the University of Hanover, Germany (1983–1986), and Senior NRC Fellow at the NASA Langley Research Center, Hampton, VA (1987–1989). His research interest is in the areas of structural dynamics, structural control, system identification, and antenna and radiotelescope pointing and control. At the Jet Propulsion Laboratory he is responsible for the advanced development of the control systems of NASA Deep Space Network antennas. He was also a consultant on control system design to several radiotelescope projects, including the NRAO 100-meter Green Bank Telescope in West Virginia, and the 50-meter Large Millimeter Wavelength Telescope in Pueblo, Mexico. He is an author of two books: *Balanced Control of Flexible Structures* (Springer 1996), and *Dynamics and Control of Structures* (Springer 1998).



**HARI B. HABLANI** received his B.S. in mechanical engineering in 1972 from Government College of Engineering and Technology, Raipur, Madhya Pradesh, and his M.S. in 1974 and Ph.D. in 1978 (both in aeronautical engineering) from the Indian Institute of Science, Bangalore, India. He passed his M.S. with distinction and his Ph.D. with the P.S. Narayan Gold Medal. From 1978 to 1980, he was a Postdoctoral Fellow in the Department of Aeronautical and Astronautical Engineering, Purdue University, West Lafayette, Indiana. For the following two years, he was a NASA National Research Council Resident Associate at Johnson Space Center, Houston, Texas. Since 1982, he has been with The Boeing Company (formerly Rockwell International), Human Space Flight & Exploration, Huntington Beach, California, where he currently is a Technical Fellow in the Flight Systems Design & Analysis Group. In the past 19 years, he has been responsible for detailed design and simulation of spacecraft and interceptor dynamics, control, determination, guidance, and navigation. Dr. Hablani has received numerous awards for his contributions, including the Leonardo da Vinci (the Spirit of the Renaissance) Engineer of the Year 1991 award, and patent and innovation awards. He has numerous publications, both internal and external. He has been an Associate Fellow of AIAA since 1994.



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**PING LU**, Associate Professor of Aerospace Engineering and Engineering Mechanics at Iowa State University, received his B.S. from the Beijing Institute of Aeronautics and Astronautics, China, in 1982, and his M.S. and Ph.D. in aerospace engineering from the University of Michigan in 1984 and 1988, respectively. He worked as a Postdoctoral Research Fellow from 1988 to 1989 at the University of Michigan. Since 1990, he has been with Iowa State University. His research interests include guidance, nonlinear control theory and applications, and trajectory optimization. He is an Associate Fellow of AIAA and has served as a Member of the AIAA Technical Committee on Guidance, Navigation, and Control.



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**MICHAEL B. MCFARLAND**, Senior Systems Engineer with Raytheon Electronic Systems, is involved in a variety of research and development activities related to advanced missile guidance and control algorithms. He received his B.S. in aerospace engineering with high honors from the University of Florida in 1991, and his M.S. and Ph.D. in aerospace engineering from the Georgia Institute of Technology in 1992 and 1997, respectively. From 1991 to 1999, he was a Research Aerospace Engineer with the Air Force Research Laboratory Munitions Directorate at Eglin Air Force Base. Some of his previous research efforts focused on genetic algorithms, hybrid numerical/analytical methods for optimal aeroassisted orbit transfer vehicle guidance, robust nonlinear missile autopilot architectures, missile guidance laws, adaptive nonlinear control using artificial neural networks, and optimal path planning. His current research interests include guidance and control of hypersonic missiles, applications of adaptive and nonlinear control theory, and artificial neural networks. He is a Senior Member of AIAA, Member of the AIAA Missile Systems Technical Committee, Member of the Institute of Electrical and Electronics Engineers, and Life Member of Tau Beta Pi.



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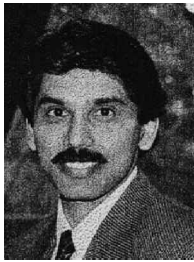
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**STEPHEN OSDER** is currently an Independent Consultant in guidance, controls, and avionics systems design. He retired from McDonnell Douglas Helicopter Systems, where he was a Corporate Fellow. He has a B.S. in electrical engineering from the City College of New York and an M.S. in electrical engineering from Johns Hopkins University. He joined McDonnell Douglas in 1985 as Chief Scientist for Controls and Avionics and was responsible for advanced development in rotorcraft flight control, fire control, navigation, and related avionics. He spent many years at Sperry Flight Systems (now Honeywell), where he was Director of Research and Development. His contributions have been in guidance and control systems for transports, fighters, bombers, helicopters, missiles, re-entry vehicles, spacecraft, and UAVs. He has published many papers on fly-by-wire systems, fault tolerant computer technology, avionics architectures, and guidance and navigation, and he holds 16 patents in related areas. He is an Associate Fellow of AIAA and a Member of the Institute of Electrical and Electronics Engineers and the American Helicopter Society, and he has been Associate Editor of the *Journal of Guidance, Control, and Dynamics* since the journal's inception.



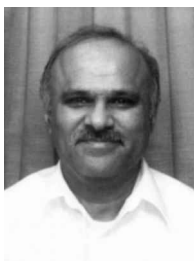
**MARK L. PSIAKI** is an Associate Professor in the Sibley School of Mechanical and Aerospace Engineering at Cornell University in Ithaca, New York. He received a B.A. in physics from Princeton University in 1979. After graduation, he worked at the RCA Space Center in East Windsor, New Jersey as a Mechanical Design Engineer for the TIROS program. In 1982, he reentered Princeton as a graduate student in mechanical and aerospace engineering and earned an M.A. in that subject in 1984 and a Ph.D. in 1987. He has worked at Cornell continuously since 1986 except for a one-year sabbatical from 1994 to 1995 when he had the honor of being a Lady Davis Fellow in the Aerospace Faculty at the Technion in Haifa, Israel. Currently, his principal research interests are in the areas of estimation and filtering, spacecraft attitude and orbit determination, GPS systems, and spacecraft attitude dynamics and control. He has received the best paper awards for the 1997 AIAA Guidance, Navigation, and Control conference and the 1998 AIAA/AAS Astrodynamics Specialist conference. In 2000, Cornell's Mechanical and Aerospace Engineering School selected him to receive its Dennis Shepherd Teaching Award. He is an Associate Fellow of the AIAA and served on its Guidance, Navigation, and Control Technical Committee from 1992 to 1995.



**I. MICHAEL ROSS** is an Associate Professor of Space Systems Engineering and Program Director of the Guidance, Control, and Optimization Laboratory at the Naval Postgraduate School (NPS) in Monterey, CA. He is the 14th recipient of the Carl E. and Jessie W. Menneken Award, the highest honor awarded by the Navy's University for Excellence in Scientific Research. His current research focus is on developing pseudospectral theory and techniques for the real-time computation of optimal controls for nonlinear and nonsmooth dynamical systems. He is the co-developer of DIDO, an object-oriented software for rapid dynamic optimization. The software and its variants have been used extensively at The Charles Stark Draper Laboratory (where he spent two years as a Visiting Associate Professor) to solve complex optimal control problems arising in astrodynamics, launch vehicle design, and missile guidance. He is also the co-developer of ACAPS, a MATLAB code used at the Jet Propulsion Laboratory for the preliminary design of interplanetary aeroassisted maneuvers. He has also been the Project Lead on PANSAT, a small experimental communications satellite built at NPS, currently in low-Earth-orbit. He has served on the AIAA Astrodynamics Technical Committee, the AIAA Mechanics and Control of Flight Award Committee, and the American Astronomical Society (AAS) Spaceflight Mechanics Technical Committee. He is an Associate Fellow of AIAA, and a Member of AAS, Society for Industrial and Applied Mechanics, and Sigma Xi.



**JUREK Z. SASIADEK** is a Professor of Aerospace Engineering in the Department of Mechanical and Aerospace Engineering at Carleton University, Ottawa, Ontario, Canada. He received his M.S. (1972), Ph.D. (1975), and D.Sc. from the Technical University of Wroclaw, Wroclaw, Poland. His research interests focus in two main areas. The first is robotics, especially space robotics and unmanned autonomous vehicles (UAVs). The second area involves guidance, navigation, and control, especially spacecraft and aircraft control and nonlinear control. In 1989–1991 Dr. Sasiadek was with the Canadian Space Agency in Ottawa, and in 1985–1987 he was a Technical Director for Alberta Research Council, Calgary, Alberta. He has authored/coauthored over 150 journal and refereed conference papers. Professor Sasiadek is a Member of the AIAA Guidance, Navigation, and Control Technical Committee. An Associate Fellow of AIAA, he was a Program Chair of the 1994 AIAA Guidance, Navigation, and Control Conference in Scottsdale, Arizona. In August 2001, he was General Chair of the 2001 AIAA Guidance, Navigation, and Control Conference in Montreal, Quebec. Currently, he is Chair of a Joint Robotics and Control Systems Societies Chapter in Ottawa.



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